IJIREEICE

ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

National Conference on Emerging Trends in Renewable Energy NCETRE 2016

Dhirajlal Gandhi College of Technology, Salem

Vol. 4, Special Issue 3, April 2016

Analysis of Multi Rated Induction Motor

Lavanya .S[1], Lakshmi Brindha .P[2], Kausalya .A[3], A. Alaudeen[4]

II-EEE Student, Dhirajlal Gandhi College of Technology, Salem[1, 2, 3]

Assistant Professor, Dept. of EEE, Dhirajlal Gandhi College of Technology, Salem[4]

Abstract: This paper deals with the analysis of multi rated induction motor. The hardware components used here are induction motor, microcontroller, LED display, and auto transformer. In normal motors there is only 4 rotor windings but in the proposed system there is 12 rotor winding. The analysis of multi rated induction motor is done by connecting the 12 rotor winding in parallel and by also connecting it in series.

Keywords: Induction motor, microcontroller, LED display, and auto transformer

I INTRODUCTION

An electric motor is an electric machine that converts electrical energy in to mechanical energy. In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry with traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy.

The field windings in the stator of an induction motor set up a magnetic field rotating through the rotor. The relative motion between this field and the rotation of the rotor induces electric current in the conductive bars. In effect the rotor is carried around with the magnetic field but at a slightly slower rate of rotation. The difference in speed is called slip and increases with load.

Asynchronous, induction motor is one of the very important and widely used ac motors. Single phase and three phase both induction motors are popular and widely used because of its simplicity, robustness, good performance. But multiphase (more than three) induction motors are becoming popular and have been being studied from many years because of its several advantages over conventional three-phase induction motors or induction motors having lesser phases.

II PROPOSED SYSTEM

Any Induction Motor has a Stator and a Rotor. The construction of Stator for any induction motor is almost the same. But the rotor construction differs with respect to the type which is specified above. Fig.1. shows the construction of squirrel cage induction motor. In our proposed system, stator side rating of motor is been changed by changing the number of winding in stator coils. As the stator is a 4 pole motor, there are 4 stator winding been connected. The number of turning in the stator coil or running coil and the thickness of the coil determine the rating of motor.

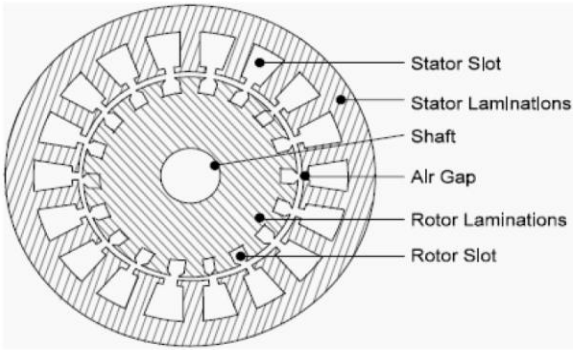

Fig.1. Construction of squirrel cage Induction motor

If the number of turning or the thickness of the coil is changed the rating of the coil can be changed. These tapings are connected to a connecting board where the powers supply. The power supply to the connection board is been adjusted by the help of an autotransformer. Through a current transformer and potential transformer, for sensing the current and voltage of the power supply. The shaft of the motor is connected to a load cell for sensing the torque of the motor and also a speed sensor is been attached. Fig.2. shows the block diagram of the proposed system

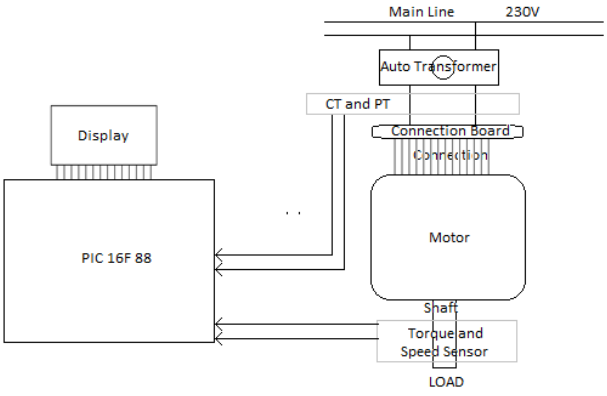

Fig.2. Block diagram

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III ROTOR WINDING

The rotor winding of the existing system consist of 4 windings. But the rotor winding in the proposed system consist of 12 windings. he motor rotor shape is a cylinder mounted on a shaft. Internally it contains longitudinal conductive bars (usually made of aluminium or copper) set into grooves and connected at both ends by shorting rings forming a cage-like shape. The name is derived from the similarity between this rings-and-bars winding and a squirrel cage. The solid core of the rotor is built with stacks of electrical steel laminations. Figure 3 shows one of many laminations used. The rotor has a smaller number of slots than the stator and must be a non-integer multiple of stator slots so as to prevent magnetic interlocking of rotor and stator teeth at the starting instant.

The rotor bars may be made either of copper or aluminium. A very common structure uses die cast aluminium poured into the rotor after the laminations are stacked. Some larger motors have aluminium or copper bars which are welded or brazed to end-rings.

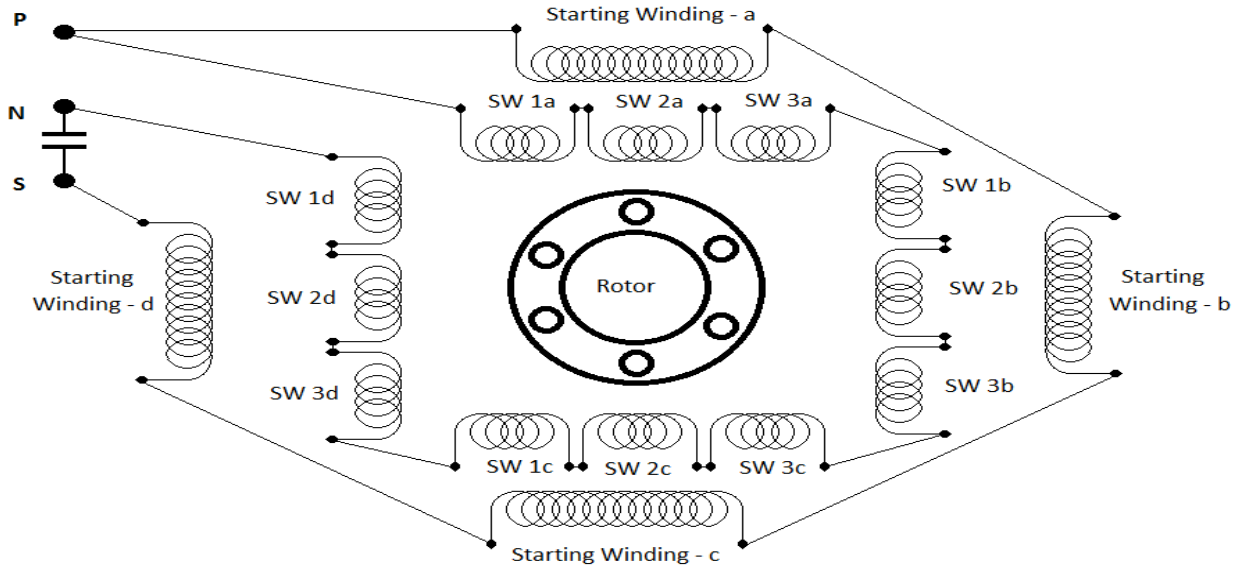

Fig.3.Series Winding 3 coil

Since the voltage developed in the squirrel cage winding is very low, no intentional insulation layer is present between the bars and the rotor steel. The analysis of multi rated induction motor is of by two ways, they are

- series winding analysis-1(2 windings) (Fig.3)
- series winding analysis-2(3 windings) (Fig.4)
- parallel winding analysis-1(2 windings) (Fig.5)
- parallel winding analysis-2(3 windings) (Fig.6)

Most AC motors are induction motors. Induction motors are favored due to their ruggedness and simplicity. In fact, 90% of industrial motors are induction motors.

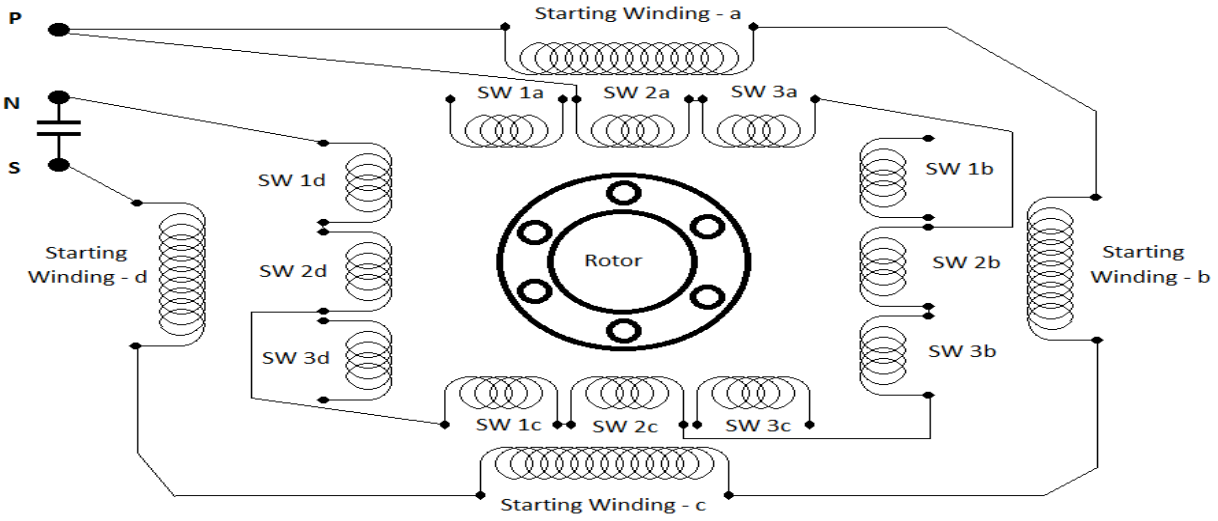

Fig.4.Series Winding 2 coil

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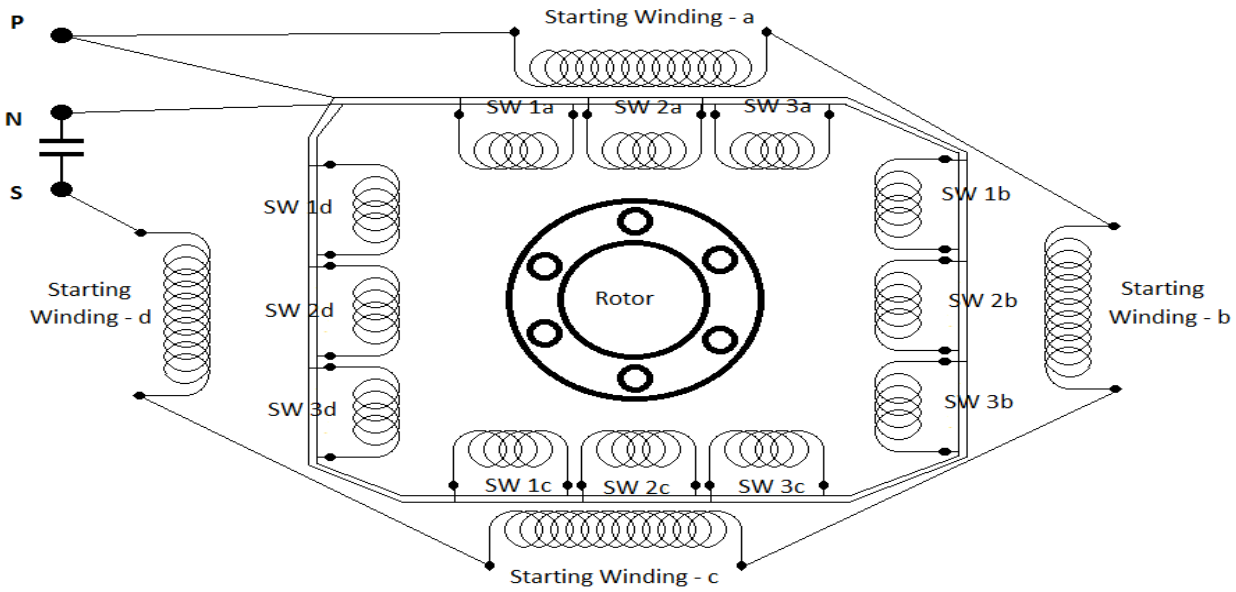

Fig.5.Parallel Winding 3 coil

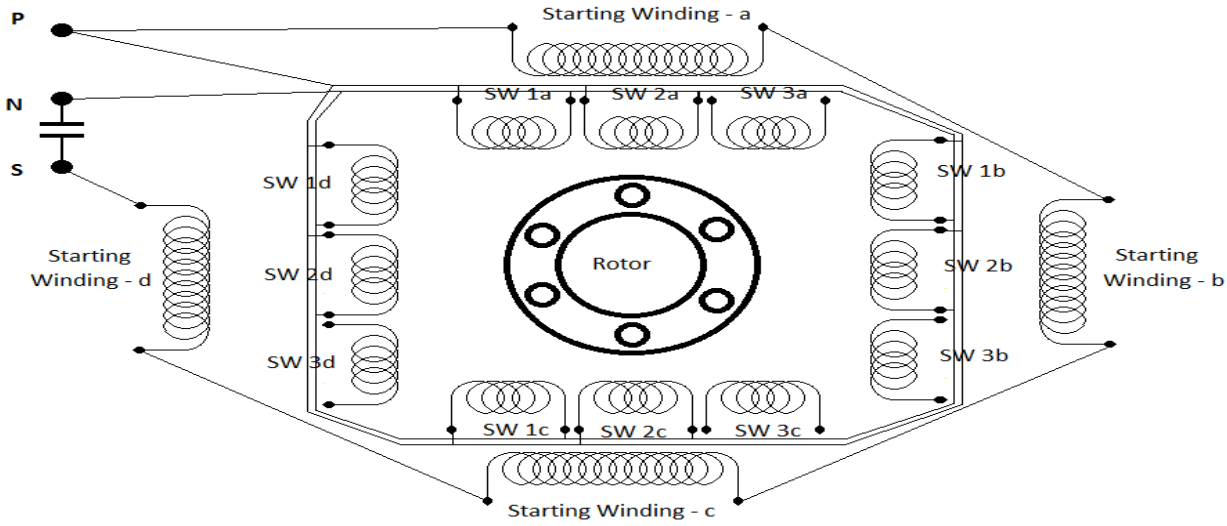

Fig.6.Parallel Winding 2 coil

CONCLUSION

On analyzing the project, the current consumed by the proposed system is higher than actual motor since the reluctance of the motor is decreased and load handling capacity of the motor is reduced as the rating of motor is reduced. Series connection consumes lesser current compared to parallel connection and load to current variation in series is more than parallel.

So this states that parallel connection has less current variation to load. So the main power consumed is for loss and less power is consumed for producing torque. In series winding the load to current is linear as a motor and three coil connection is the normal connection in the existing motor. But two coil connections has no desirable variation. So we conclude that existing motor has a higher efficiency and less loss compared to proposed design.

And for further analysis can be done for tapping in stator winding also and this can be implemented in all types of motor and their performance can be analyzed for better efficiency. In future scope, it can be tested of DC motor, Slip Ring motor, Special Motor and also for Alternators and Generators.

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